

NAVAL POSTGRADUATE SCHOOL  
Monterey, California

EC 3210

MIDTERM EXAM II

11/88Po

- This exam is open book and notes.
- There are three problems; each is equally weighted.
- Partial credit will be given; be sure to do some work on each problem.
- Be sure to include units in your answers.
- Please circle or underline your answers.
- Show *ALL* work.

1	
2	
3	
Total	

Name: \_\_\_\_\_

1. Consider a Doppler-broadened laser operating at  $4.5 \mu\text{m}$  with a linewidth of 15 GHz. The index of refraction of the lasing medium is known to be 1.5. Find the saturation irradiance of this laser.

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2. Consider a laser resonator with one mirror with a radius of curvature of +2 meters. If the mirror spacing is desired to be 1 meter and we want the resonator to be stable, calculate the complete range of values for the radius of curvature of the other mirror. (Include points of marginal stability in your answer.)

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3. Consider a laser whose output irradiance is 1% of its saturation irradiance. The laser mirror reflectivities are known to be 100% and 98%. If the small-signal round-trip gain is 5.0%, calculate the internal loss coefficient  $\alpha_{\text{int loss}}$  for this laser. **(Added information: You need a value of L to solve this problem; assume L = 10 cm.)**